February 1963

EMO

NATIONAL DIGEST

Studies and Exercises

Household Food Supplies for an Emergency

The Water Engineer and Radioactive Fallout

Hurricane Cleo

Financial Assistance Program

Emergency Health Planning

Radiation

Role of the Dentist in a National Emergency

THE EMO NATIONAL DIGEST

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STUDIES AND EXERCISES

by

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Introduction

A COMPLETE and comprehensive treatment of a broad subject such as "Studies and Exercises" is beyond the scope and intention of the EMO National Digest. Such information is available in part in existing publications, such as Canadian Army Training Manuals, and will be available in detailed form in a forthcoming Emergency Measures Organization publication. Thus, in this article, it is intended to discuss briefly and in broad terms only some aspects of studies and exercises which it is hoped will be of interest to readers generally.

If an emergency measures organization is to be efficient and effective, progressive general and specific training for its members is a definite requirement. Ideally, this training should be done in progressive stages culminating in collective and combined studies and exercises. The purpose of these studies and exercises varies but, in general terms, will include one or more of the following objectives:

(a) The stimulation of interest;
(b) The advancement of training;
(c) The advancement of local planning;
(d) The development of emergency measures operational doctrine;
(e) The practising of procedures;
(f) The development of interdepartmental co-operation;
(g) The testing of efficiency.

Initial "training" consists of educating individual personnel in emergency measures organization and procedures. "Studies" take the form of organized discussion groups held with the objective of advancing local planning or of developing emergency measures doctrine. "Exercises" are designed to practise procedures and, more specifically, to further develop our emergency measures capabilities.

In the study field, the greatest benefit can be derived by a thorough airing and sifting of ideas. Studies usually have an academic approach. Problems, either policy or procedures, are set and considered in theory then discussed in a way which would not be possible or desirable during actual periods of operation. To achieve this end, the syndicate discussion method is most admirably suited.

The main variations in exercises as far as emergency measures are concerned are the staff studies, warning and emergency HQ manning, assembly of forces and exercises involving one or two levels of government and designed to develop specific aspects of staff organization or operational procedures. Thus, exercises cover the whole range from the municipal study up to the full-scale national and international exercise. They do, however, have one common feature—those taking part are performing their emergency function in an approximation to emergency conditions.

Study Topics

The subjects considered suitable for the group study type of activity will vary according to the status of local planning in each particular municipality or emergency measures organization. For example, during the early stages of the development of municipal plans a consideration of one or a group of several municipal services is most useful in exposing the problem areas and achieving resolution of controversial points. Once the individual services have been examined, more general functional areas can be examined by means of the "study" method.

Exercise and Study Cycle

The study group activity described above is normally a prerequisite to exercise activity and, as in general training, exercise activity should be approached in progressive stages. Also, it would be helpful to the elected officials and public servants of departments and agencies having an emergency function, at all levels of government, to have their commitments to these activities known well in advance. The specific aims of studies and exercises can be carefully planned and supervised if a proper programme cycle is used.

As an example, each government department should have one exercise or study group activity a year and each headquarters, regional, zone or municipal, should be exercised once a year. Within each province, there should be a selection of regional, zonal and municipal studies or exercises, depending on the state of planning and capability, during a year when no national exercise

is being conducted. The effect this program would have over a two-year period is illustrated as follows:

(a) *1963*
  (i) National Exercise (TOCSIN type);
  (ii) Municipal studies at local level;
  (iii) Federal and provincial departmental studies regarding departmental plants;
  (iv) For all headquarters, a warning exercise.

(b) *1964*
  (i) International exercise (federal central government only);
  (ii) Regional exercise in each region;
  (iii) Zonal studies;
  (iv) Municipal studies and exercises;
  (v) Federal and provincial departments—one study;
  (vi) For all headquarters, a warning exercise.

Participation

The selection of participants for a study or exercise is usually quite obvious but, to avoid wasteful effort, care should be taken to select those personnel who have a direct interest in emergency planning or operations and those elected representatives who have an emergency function.

Exercises and studies should be announced as early as possible, not only because of the preparation required but also because participants may require considerable notice in order for them to arrange other commitments to permit their attendance at the study or exercise. An exercise programme covering the whole training season usually satisfies this advance notice requirement.

Observers

Although, as mentioned above, participation should be restricted to those who have a direct function in the emergency organization, a good deal of benefit can result from the attendance of observers from other levels or areas of emergency measures organization. In many instances, general information gained by the observer can be used to modify his organization or operational procedure for the mutual benefit of all parts of the emergency measures organization.

Public Information

Public information is a vital aspect of emergency measures operations and should form an integral part of most exercises. Two types of public information should be considered when preparing exercises. These are the public information problems inserted into the exercise to develop public information planning for emergencies and the "real" public information plan designed to inform the public about the exercise through representatives of the media of press, radio and television.

In the latter instance, the representatives have at least a story interest in the exercise. It is obviously essential that they have the opportunity to report fairly and objectively on the conduct of the exercise. Opinions based on insufficient information often are misleading and sometimes when published have unfortunate effects. For this reason alone press, radio and television representatives must not be neglected or left to fend for themselves. It is usually to the mutual benefit of both the press and the exercise or study director if reception and press briefings are on an organized basis.

Preparation

Both studies and exercises have three phases in common. They may be divided into the preparation, the study or exercise itself, and the analysis. The first and last phases are of equal importance to the study or exercise itself since it cannot succeed without adequate preparation, and much of the value of the exercise or study will be lost if a proper analysis is not completed.

The first step in the preparation is to hold a meeting which might be described as the directors conference which should be attended by a representative of each of the services taking part. The purpose of this first meeting is not to decide the details of the exercise or study but rather this meeting is concerned chiefly with the following items:

(a) To decide what is to be achieved or the lessons which are to be learned;

(b) To set the aim of the study or exercise;

(c) To decide what personnel will attend a study, and the levels of organization to be exercised in the case of an exercise;

(d) To appoint the study or exercise director if this has not been done previously;

(e) To decide the major administrative matters such as the date, duration and location of the study or exercise.

A study or exercise should have one aim or, at the most, two related aims known to everyone participating. A multiplicity of aims or an indefinite and shifting aim will lessen the effectiveness and value, making it impossible to draw useful conclusions. Participants will become confused if they are keeping their minds on too many aims. Thus, a single, clear and precise aim is extremely important if the project is to be successful.

When dealing with zones or municipalities, primary and secondary tasks in line with the overall pro-

vincial plan should be indicated to the exercise planning staff. The primary task of a particular municipality may be reception in accordance with the provincial plan and, if so, this function should be given priority in study and exercise activity for this municipality.

Emphasis should be placed on further developing capabilities rather than merely testing individuals in emergency measures and procedures. Erroneously, it is quite often assumed that an exercise should not make demands on participants which have not been anticipated by their training. Exercises and studies should be sufficiently ambitious to extend the better trained participants.

The selection of the director and directing staff is important. The calibre, competence and general ability of these personnel at all levels is crucial in achieving the real objectives of the exercise. In an exercise particularly, the directing staff have two co-related but quite distinctive functions to perform. They must concern themselves with the broad concept and direction. In addition, they must ensure that the headquarters to which they are attached is exercised to its maximum in all the functions it would perform under actual emergency conditions. For this reason, directing staff must be thoroughly conversant with all exercise orders and all operating procedures.

In the smaller headquarters organizations, it may be necessary for personnel to act as both player and directing staff. If this is so, they will have to be regarded as "trusted agents" and relied upon not to divulge their directing staff knowledge of the exercise. In most instances, the main purpose of the exercise is to develop capabilities further; hence, the security aspect of exercise problems should not cause undue concern.

The initial planning meeting mentioned above should be followed closely by another meeting under the chairmanship of the exercise or study director and attended by the planning and directing staff. This meeting should be concerned mainly with adjustment to the draft attack picture (Army responsibility in likely target areas), time-table of preparations for the study or exercise, the delegation of work, and selection of a name for the study or exercise.

If an attack pattern or picture is required, this should be adjusted as required to meet the needs of the exercise as soon as possible. Adjustments at a later stage in planning may be practically impossible without a good deal of wasted effort.

Once the attack picture has been settled, the amount of work involved will be foreseeable and it should be possible to work out a time-table showing the order in which various planning tasks are to be dealt with and the dates by which they must be completed. If this is not done, there is a strong tendency to leave these tasks until the last moment when there is insufficient time to complete them satisfactorily.

Along with the problem of when work is to be completed, there is the question of who is to do it. In small-scale exercises, the director and his immediate staff may be able to carry the complete workload. Usually, however, delegation of the work is a requirement. Care must be taken to ensure that material prepared is consistent and the reconciliation of exercise material is the job of the exercise director. Any data which affects the exercise as a whole obviously must be produced by the director and his immediate staff.

In accordance with the planned general concept of the exercise, different participating departments and agencies should be made responsible for the preparation of information, incidents and problems for injection into the study or exercise. This material must be carefully co-ordinated and this can best be achieved through periodic meetings of the planning staff. This co-ordination is facilitated if an exercise planning room can be set aside for this purpose.

A name for the exercise should be selected early in the planning stages. The administrative convenience of having an easy reference is obvious since it enables one to refer to it by a specific name rather than "that exercise on the 1st of March". If a suitable name (not depressing or frivolous) is not selected early, one or more unofficial and undesirable names are bound to come into use.

A complete set of papers, all bearing the name of the exercise and in a format acceptable to all components and agencies, should be made up in two parts:

(a) *General Instructions*—to be distributed to all taking part and consisting of study or exercise orders plus an opening narrative leading up to the situation at the beginning of the exercise;

(b) *Directing Staff Instructions*—to be distributed to the directing staff only and consisting of the attack situation, the outline of events for the whole exercise, orders for the directing staff not covered in the General Instructions.

Conduct

In many areas, personnel other than players will be at a premium and the evaluation as well as the conduct of the exercise will be the responsibility of a limited directing staff. In general terms, the duty of the DS in the conduct of the exercise will be to create the situation required by the outline of events. This usually involves feeding in messages and injecting incidents to create a realistic atmosphere. The directing staff must maintain contact with the conduct of

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HOUSEHOLD FOOD SUPPLIES FOR AN EMERGENCY

Prepared by
Emergency Welfare Services Division,
Department of National Health and Welfare.

INITIALLY, the survival of people in the event of a nuclear attack could depend to a large extent on the preparations which are made by individuals and families now and what they can do for themselves at the time of an emergency.

The Need for Family Preparedness

Advance preparations in relation to food are necessary because it can be assumed that in the event of a nuclear attack there would be food shortages. This situation would be due to destruction of food processing plants and warehouses, disrupted channels of food distribution, contamination of crops and animals by fallout, disrupted public utilities with resulting loss of ordinary cooking facilities. Various controls, including rationing, would be necessary to ensure as far as possible the equitable distribution of surviving food supplies.

The Situations for Which People Should Plan to Have Some Food

In the more probable target areas, people would have the choice of evacuating or remaining in the area should an attack become imminent. Whatever their choice might be, they would require water and food. If they voluntarily evacuate they should have these items ready to take in the car or to carry with them. If they should choose to remain in shelters or basements, water and food would be essential for survival. In areas of the country other than probable target areas, people would need food to supplement existing stocks in a period of scarcity and tight controls, or for use in shelters or basements in case their area was subjected to radioactive fallout.

Therefore, it is recommended that all persons have an Emergency Food Pack—preferably for a period of fourteen days, but at least sufficient for seven days.

Recommendations for an Emergency Food Pack

Regardless of the purpose for which household emergency food stocks are being planned, the general characteristics of the recommended foods are the same.

The following recommendations are made:

(1) Water and/or other liquids are of prime importance for survival. One gallon of water per person per day is the minimum amount recommended for all purposes in shelters or basements. More is desirable if possible. It can be kept in mind that the household hot water tank would be a reliable source of safe water. For those evacuating, at least a total of two quarts per person should be taken.

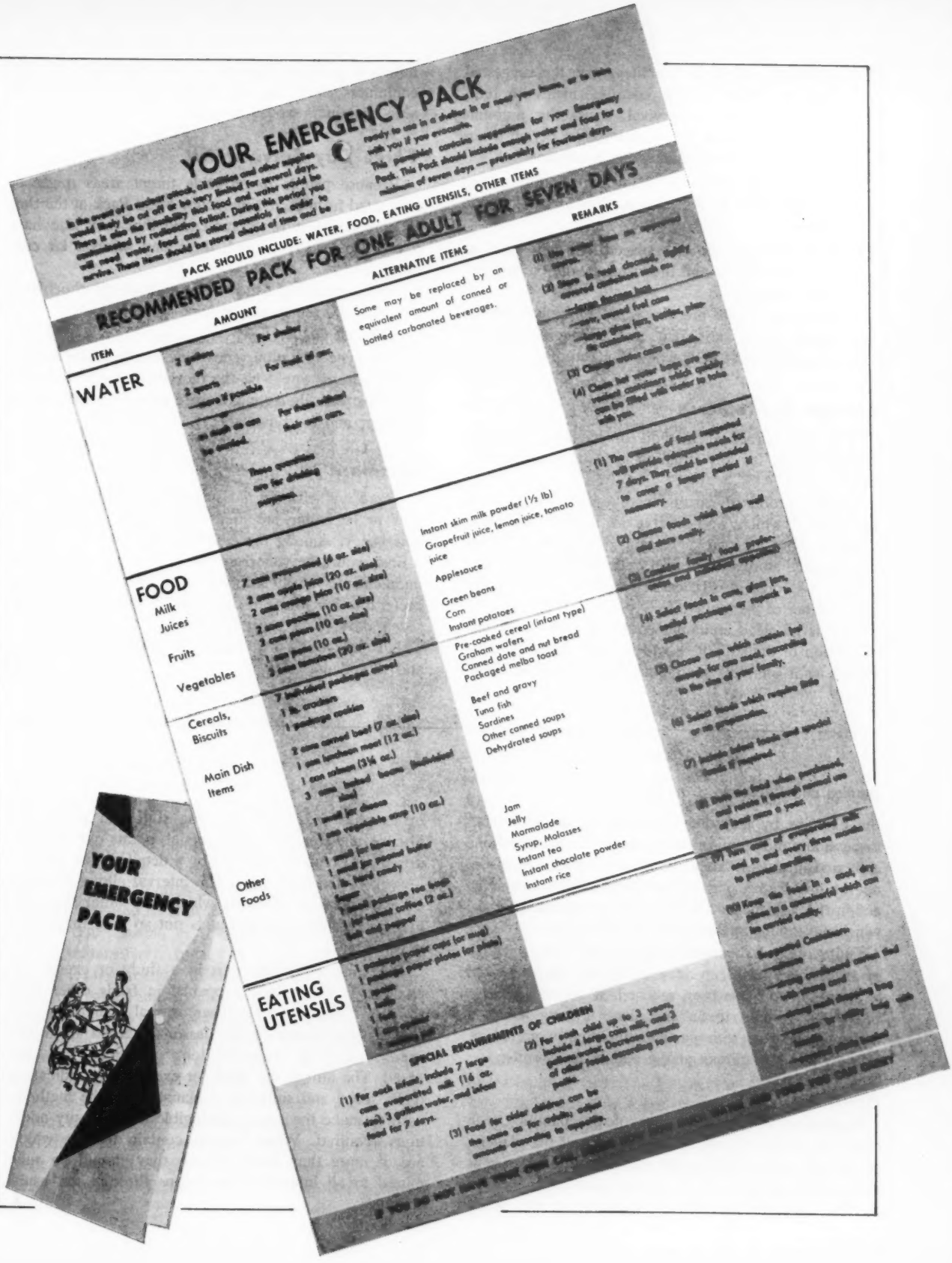
(2) As far as food is concerned, common foods which are commercially available are recommended. Those known to have good keeping qualities, as well as details concerning amounts are listed in an Emergency Welfare Services pamphlet.*

(3) It is suggested that some foods be chosen from each of the five broad food groups i.e. canned and dried milks; canned juices, fruits, and vegetables; packaged biscuits and ready-to-eat cereals; canned meats, fish, and ready-to-eat main dish items; other foods including spreads, hard candy, sugar, and instant beverages.
Such a selection would provide some variety, and family food preferences could be considered. Although these are not essential factors when thinking in terms of survival, nevertheless they could be important psychological factors in time of disaster.

(4) Foods which require no preparation or very little preparation, and which could be eaten cold directly from the container, are preferable due to the probability of restricted cooking facilities. Although many dehydrated items have a long shelf life if properly stored, sufficient water must be available for their reconstitution.

(5) Food and water must be protected from radioactive dust. Therefore cans, glass jars or other tightly closed containers and packages are essential. Containers which contain just enough food for a meal according to the size of the family are preferable in order to avoid left-overs remaining at room temperature.

(*) *Your Emergency Pack* pamphlet, available from Provincial and/or Municipal Civil Defence/Emergency Measures Organizations.



YOUR EMERGENCY PACK

In the event of a nuclear attack, all utilities and other supplies would likely be cut off or be very limited for several days. There is also the possibility that food and water would be contaminated by radioactive fallout. During this period you will need water, food and other essentials in order to survive. These items should be stored ahead of time and be ready to use in a shelter in or near your home, or to take with you if you evacuate.

This pamphlet contains suggestions for your Emergency Pack. This Pack should include enough water and food for a minimum of seven days — preferably for fourteen days.

PACK SHOULD INCLUDE: WATER, FOOD, EATING UTENSILS, OTHER ITEMS

RECOMMENDED PACK FOR ONE ADULT FOR SEVEN DAYS

ITEM	AMOUNT	ALTERNATIVE ITEMS	REMARKS
WATER	2 gallons (or 2 quarts if possible) — For drinking — For basic all uses	Some may be replaced by an equivalent amount of canned or bottled carbonated beverages.	(1) Use water from an approved source. (2) Store in food chemical, tightly covered containers such as — large thermos bottles, — large glass jars, bottles, plastic containers. (3) Change water once a month. (4) Chalk hot water bags are good radiant containers which easily can be filled with water to take with you.
FOOD			
Milk	7 cans evaporated (6 oz. size)	Instant skim milk powder (½ lb)	(1) The amounts of food suggested will provide adequate meals for 7 days. They could be extended to cover a longer period if necessary.
Juices	2 cans apple juice (20 oz. size) 2 cans orange juice (10 oz. size)	Grapefruit juice, lemon juice, tomato juice	
Fruits	2 cans peaches (10 oz. size) 3 cans pears (10 oz. size) 1 can pears (10 oz.)	Applesauce	(2) Choose foods which keep well and store easily.
Vegetables	3 cans tomatoes (20 oz. size)	Green beans Corn Instant potatoes	(3) Consider family food preferences and nutritional requirements.
Cereals, Biscuits	7 individual packages cereal 1 lb. crackers 1 package cookies	Pre-cooked cereal (infant type) Graham wafers Canned date and nut bread Packaged melba toast	(4) Select foods in cans, glass jars, sealed packages or ready to serve.
Main Dish Items	2 cans corned beef (7 oz. size) 1 can luncheon meat (12 oz.) 1 can salmon (3¼ oz.) 3 cans baked beans (individual size)	Beef and gravy Tuna fish Sardines Other canned soups Dehydrated soups	(5) Choose cans which contain just enough for one meal, according to the size of your family.
	1 small jar cheese 1 can vegetable soup (10 oz.)		(6) Select foods which require little or no preparation.
Other Foods	1 small jar honey 1 small jar peanut butter 1 lb. hard candy Sugar 1 small package tea bags 1 jar instant coffee (2 oz.) Salt and pepper	Jam Jelly Marmalade Syrup, Molasses Instant tea Instant chocolate powder Instant rice	(7) Include infant foods and special foods if required.
			(8) Date the food when purchased, and rotate it through normal use at least once a year.
EATING UTENSILS	1 package paper cups (for soup) 1 package paper plates (for plate) 1 spoon 1 knife 1 fork 1 can opener 1 sanitary pail		(9) Turn cans of evaporated milk over and to end every three months to prevent curdling.
			(10) Keep the food in a cool, dry place in a cupboard which can be sealed easily.
			Suggested Containers — sanitary pail — strong cardboard cartons and with strong cord — strong mesh shopping bag — garbage can (with cover) for utility kits with handle — cupboard plainly labelled

SPECIAL REQUIREMENTS OF CHILDREN

(1) For each infant, include 7 large cans evaporated milk (16 oz. size), 3 gallons water, and infant food for 7 days.

(2) For each child up to 3 years, include 4 large cans milk, and 3 gallons water. Decrease amounts of other foods according to appetite.

(3) Food for older children can be the same as for adults; adjust amounts according to appetite.

IF YOU DO NOT HAVE YOUR OWN CAN OPENER, BUY ONE AND KEEP WITH YOUR EMERGENCY PACK

YOUR EMERGENCY PACK

(6) Although individual appetites vary, the suggested amounts would provide adequate meals for fourteen days. On a survival basis, the amounts could be extended for a much longer period if circumstances should make this necessary.

(7) Special requirements of infants and young children must be considered when assembling the supplies.

(8) Food items should be replaced with new stock at least once a year and the water should be changed once a month.

Since the foods are the type normally used in family meals, no extra cost is involved in the maintenance of emergency food supplies.

Storage Containers

The most practical method of having emergency supplies ready for any situation is to have them portable.

Strong cardboard cartons with open slot grips or heavy cord which would serve as handles, or mesh shopping bags are two suggestions. These would serve as compact storage containers for shelters or basements, and could also be carried to the car quickly by any member of the family.

Any large clean container could be used for water. A portion of the supply should be kept stored in containers with handles, so it could be moved on short notice if required. Because of the possibility of glass containers shattering and breaking, other non-breakable containers would be safer.

Three Day Survival Kit

Because people in probable target areas might be separated from their Emergency Food Pack at the time of emergency, it is recommended that they also have a compact, easily carried, three day survival kit containing:

One pound of candy (any kind except chocolate)
One 20 ounce can of juice
A can opener.

This type of ration, consisting solely of liquid and carbohydrate, would be the most valuable for survival purposes for a short time, if there were no other sources of water and food available.

Summary

There are self-help measures which people can take now to be better prepared in the case of a national emergency. Among the essentials for survival at such a time would be water and food. The assembling and maintenance of household emergency food stocks, preferably for fourteen days but at least sufficient for seven days, is a sensible approach to preparedness. This is something any individual and family can do—and should do. ▲

Studies and Exercises *(Conclusion)*

the exercise by attending meetings; listening to staff discussions and monitoring correspondence, telephone calls and messages. They should not interfere with the operations of the players but should take corrective action through the introduction of contingent incidents which will point up the errors or omissions.

Quite often it becomes obvious that the objective of an exercise has been achieved before the estimated termination time has been reached. If so, the exercise should be brought to an end since nothing leaves a worse impression with participants than a period of idleness and anti-climax at the end of an exercise.

Analysis

Regardless of the soundness of the planning, the efficiency of the DS, and the enthusiasm of the players, no exercise will yield its full value without a careful and critical analysis. It is a good practice to hold a meeting immediately after termination of the study or exercise to enable directing staff and players to discuss and resolve controversial points which have arisen. This can be followed by a detailed post mortem a week or ten days later. The interval allows time for an assessment of the facts which may differ from the first impressions gained, but is not so long that detail is forgotten.

Everyone who takes part in a study or exercise is anxious to know what happened in fields other than their own specialty. However, a real exercise report consists essentially of the lessons learned from the exercise and the considerations on which they are based. The aim of the study or exercise, an indication of its scope and sufficient explanation of the methods used to make the report intelligible are the only additions required. When reports contain lessons which are of more than local interest, they should be submitted to all interested formations through the usual channels. ▲

THE WATER ENGINEER AND RADIOACTIVE FALLOUT

by
S. N. WHITE
Federal Survival Planning Officer

Introduction

AT a time of international crisis the hazards of nuclear warfare give all Canadians great concern. Personal survival, fallout shelters and emergency measures of all types are common topics of discussion in the press, on radio and TV and among groups of serious minded persons. While it is well for the public at large to consider these matters and to take the steps necessary for their own survival, it is imperative that those who are professionals pay great attention to the services that they must perform towards the public.

It is vital that they should know and understand the effects of nuclear war upon those services, and that they should develop a professional competence in reducing the vulnerability of those services to such effects. Water is the most important commodity in the sustenance of life. Those who are responsible for the provision of potable water to the public in peace-time have an even greater responsibility in time of war when radioactive fallout can travel across our country contaminating watersheds, open reservoirs, lakes and streams. Under these circumstances a precise knowledge of the characteristics of fallout together with accurate information on the behaviour of our water systems under all meteorological and climatic conditions will enable the water engineer to reduce very significantly the hazards in the water which he passes on for the public to consume.

It is not possible in a short space to cover this subject exhaustively. Indeed it would take many papers or a large manual to deal adequately with all the aspects involved and to present the numerous graphs, charts and tables upon which calculations can be based. This article will therefore endeavour to indicate the nature of the hazard to our water supplies, show how a knowledge of the behaviour of the water in the system can be used to reduce the hazard and suggest various measures to which water engineers should turn their attention. In compiling it, extensive use has been made of work done elsewhere, especially that of Professor Myron B. Hawkins of the University of California.

Radioactive Fallout

It is not proposed to explain the now familiar phenomena of the nuclear detonation, but rather to dwell upon those aspects of radioactive fallout which are relevant to a complete understanding of the means by which large areas of terrain may become contaminated.

When a nuclear weapon, whether it is a fission or a fission-fusion weapon, explodes, the products of the fission are radioactive, and because of the great heat produced undergo first vaporization and subsequently condensation. When the explosion takes place near the earth so that the fireball touches the ground thousands of tons of pulverized debris—earth, buildings, rock, etc. depending on the locale—are drawn into the fireball and some of this too will undergo a vaporizing and/or melting and resolidifying process. It is generally assumed that the fission products are distributed homogeneously through the debris. Consequently, as the fission products condense they may do so on inert particles of dust or actually condense simultaneously with a melted particle and so become enclosed in it. In this manner the debris which is drawn up from the ground becomes a carrier of radioactivity without necessarily becoming radioactive itself.

The pulverized debris forms the characteristic cloud associated with the nuclear explosion and, depending upon the size of that explosion, parts of it may get carried up to heights of 80,000 (or more) feet. This cloud is obviously subject to the winds prevailing at various heights and is moved according to their speed and direction. As it moves, the particles of debris including those with their radioactive "passengers" descend through the various levels of wind and are ultimately deposited on the surface of the earth. Generally speaking the heavier particles are not carried up to such a great height as the lighter ones and they fall faster. Therefore, they come down to earth earliest and closest to ground zero. Assuming the homogeneous distribution of radio-activity throughout the fallout one would therefore associate higher intensities of radiation with heavier depositions of fallout, and this has been confirmed in various tests.

Contamination of Water

Fallout settling on the surface of the earth will contaminate any water with which it comes in contact. This means that our water supplies may be contaminated in the following ways:

Immediate contamination—fallout deposited on lakes, reservoirs and flowing rivers or open aqueducts.

Delayed contamination—fallout deposited on watersheds and washed into supply tributaries, or reaching other surface water supplies.

Deferred contamination—fallout deposited on snow or ice on watersheds and frozen rivers, lakes or reservoirs.

Dealing with such widespread contamination appears to be a formidable task, and if we are to be at all effective we must understand something of its nature.

In the first place the contaminating agent (the fission products) is a mixture of radioactive isotopes, each with its own rate of decay. As a result, the composition of the contamination varies as time progresses and various isotopes assume greater or less importance in relation to the whole at certain intervals of time. However, we are able to use a decay law which approximates to the performance of the mixture as a whole, and from this deduce the intensity of gamma radiation at any given time.

When fission products are ingested however, say by consuming contaminated water, then some will seek out various parts of the body such as strontium—the bone; and iodine—the thyroid. Others may spend only a short time in the body before being excreted, but will obviously commit some dose to it during passage. In addition to gamma other types of radiation such as beta are also significant inside the body. We, therefore, have to know how to relate the dose committed to various parts of the body to the level of contamination in the water.

From a knowledge of the intensity of fallout deposited on the surface of the water, the contamination per unit volume can be worked out, from which the dose to various parts of the body, such as the bone, the thyroid and the gastro-intestinal tract, from drinking a given amount of water can be estimated. It is clear that the total accumulated dosage from consuming water on successive days must not exceed tolerances set by the health authorities.

The next point to be realised is, that of the fission products some are soluble and some are insoluble. Soluble contamination naturally remains in the water, while the insoluble will be held in suspension and will obey the normal laws of suspended solids and sedimentation. It is therefore important to know the fractions of contamination in each category. The term solubility used with reference to fission products is not related solely to the radioactive element itself.

It will be remembered that at the time of formation of the fallout there were at least two ways in which the radioactive particles could attach themselves to the inert material. In some cases this was by condensation on the outside of an inert particle, while in others the radioactive particle became encased in the inert material. In the case of an explosion over predominantly sandy soil most of the inert matter would be silicon, and hence silicon particles with entrapped radioactivity entering water would not yield up the radioactive element to the water whether that element is soluble or not. Particles of clay or loam soils which have not been subjected to physical change however are likely to break down on contact with the water and release their radioactive material to it. It can, therefore, be appreciated that the percentage of soluble contamination entering the water is governed by the characteristics of the fallout, and hence by the locale of the explosion.

Various estimates exist as to the solubility of close-in fallout and of these 10 per cent seems unnecessarily high while 2 per cent appears to be a good average.

In addition the solubility of the fission products in the gastric juices has some bearing on the dose committed to the body.

Effects of Various Features in Water Systems

Now that the general characteristics of the contamination have been discussed, it is time to consider how various parts of the water systems can affect the quantity and intensity of the contamination.

Ground Water

Ground water supplies are, generally speaking, the least vulnerable to contamination by fallout. Ground water sources are usually replenished by infiltration of rainfall and streams; and the percolation of water through the soil will remove most particulate matter and hence by far the greater part of the insoluble contaminant. Even soluble contamination will be reduced by ion exchange processes.

Surface Water

Surface water is more vulnerable to contamination; but exploitation of the decay laws, and a knowledge of the characteristics of the behaviour of water within the system enable us to improve the quality of the water accepted for human consumption. To give a simple

illustration. Suppose a town draws its water from a river which has become contaminated up-stream. A knowledge of the width of the fallout belt, the effective depth of the water and the intensity of fallout deposited is sufficient to estimate the contamination per cubic foot. From the characteristics of the river flow we can calculate (a) the time for the contaminated plug to reach the intake and (b) for it to pass the intake. With this knowledge it is possible to decide whether the water will be potable when it reaches the intake, or if not, when the intake should be shut off and re-opened. During the time of "shut-off", water rationed from covered reservoirs could be distributed to the populace.

Sedimentation

Another natural process is that of sedimentation. Fallout particles deposited on a quiescent lake or reservoir surface, or carried by turbulent streams to sedimentation basins will settle quite rapidly. Where the inert part of the fall-out comes from a clay loam soil all particles greater than approximately 9 micron size will have sunk below the 10 ft. level after 12 hours and below the 60 ft. level after 3 days. At the end of ten days all particles greater than two microns will be below the 10 ft. level. This means that of the total radioactivity only 20 per cent remains above the 10 ft. level after 12 hours or 0.9 per cent after ten days.

Treatment Plants

The effectiveness of various treatment processes in removing radioactive material has been estimated by various authorities and the range covered seems to be as set out below:—

Process	Percentage efficiency of the system:	
	Against Soluble Contamination	Against Suspended Contamination
Alum coagulation and sand filter	25 to 85	50 to 90
Iron coagulation and sand filter	25 to 85	50 to 90
Lime-soda ash softening	30 to 90	50 to 98
Pre-treatment*, coagulation and filter	50 to 80	50 to 95
Post treatment ion exchange	99 to 99.9	99 to 99.9

* for example, clay slurry.

What Water Engineers Can Do

Turning now to the preparations which water engineers can make, the first requirement is to determine whether there is a problem related to a particular water system, or not; and if so the nature of the problem. To do this a number of factors must be examined.

Water in protected storage such as covered reservoirs is a most precious asset. It should be carefully controlled and, if necessary, rationed from the commencement of any war emergency. It would be folly to allow such water to be wasted on domestic chores, fire-fighting or decontamination; and yet water in appropriate amounts and at appropriate times must be made available for all these purposes. Use of protected water for as many days after an attack as possible will permit decay and sedimentation processes to reduce very significantly the potential dose.

It is pointed out that the government's advice to all citizens, to be self-contained with respect to food and water for fourteen days, has considerable significance in this connection; and if followed would materially reduce the problems facing water engineers. It is suggested that it would be well within the interests of all water authorities to endorse and promulgate this advice.

The next factor is to consider for how long a water rationing system, using either protected reservoirs or ground water as sources, can be maintained and by what means. In some areas distribution by water cart may be the best method, in others the establishment of fixed water points might prove more successful.

The corollary of this is of course to consider by what means water can be made available for purposes other than human consumption. Obviously, the same tolerances with respect to the percentage of contamination in such water will not apply and hence the vulnerability of its sources is not so critical. However, its distribution may require the use of the normal distribution system, thereby necessitating the alternate means of supplying potable water referred to above.

Where it is not considered possible to meet the demand for potable water (albeit on a rationed basis), by the methods indicated, then further study of the water system is necessary. This will involve a fairly complete analysis of all sources supplying water to the system and the characteristics of the movement of water from one point of the system to another. When done, however, this will enable the effects of contamination in any part of the system to be related to a potential dose to the consumer. In carrying out such an analysis it must be remembered that we are concerned with two simple aspects. (a) The movement of soluble material and (b) the movement of particles of all sizes up to approximately 350 microns.

The next task to be undertaken is to assess the efficiency against soluble and suspended matter of the treatment processes in use, and determine how if at all this efficiency can be increased, say for example by pre-treatment with clay slurry or by an increase in filtration capability. In doing this it should be remembered that radioactive isotopes act chemically like

their non-radioactive counterparts and therefore the performance of even soluble isotopes in a chemical process can be studied.

With regard to actual measurement of contamination in the water as opposed to calculating it; it is possible to relate water contamination to a reading of gamma intensity in the water. This system however is known to be valid for the first ten days after the contaminating detonation. The rules for the system are contained in *EMO Radiological Defence Circular No. 3*. After ten days the characteristics of the contaminating isotopes have changed, but there is still reason to suppose that a relationship, sufficiently accurate for the purpose, can be established between the quantity of significant contaminants and the gamma reading. Water works engineers should, in any case, co-operate with the public health authorities in arranging suitable methods for measuring contamination at the intake, and after treatment. The public health authorities are of course the competent advisers on acceptable levels of contamination for human ingestion.

It must be remembered that measurement can only take place in the actual event of fallout; it may then be too late to worry about improving the decontaminating efficiency of the water system. This is why, as a planning measure, it is so important to carry out the analysis of the water system referred to above, so that an estimated efficiency of the system is available.

Conclusion

It is always true to say that complete knowledge of an enemy enables him to be successfully defeated. In this case the "enemy" is radioactive fallout in water. It is hoped that the foregoing has revealed some of the charactertistics of this "enemy" together with some of the natural defences against it. It remains for us to exploit the weaknesses of the one and the strengths of the other in order to reduce the hazard to manageable size. This article has also pointed to some of the more important ways of achieving this.

Protected water supplies and ground water from deep wells may be one of our most precious assets. In a war emergency, economy in its use must be not only practiced, but imposed; and citizens encouraged now to follow government advice with respect to storing water for survival purposes. In order to prevent wastage, improvised distribution methods may have to be devised. Planning and preparations relating to these points should be the first concern of water authorities.

Satisfactory arrangements as indicated above will leave time for decay, sedimentation, movement downstream and percolation through soil to reduce very considerably the initial contamination, as has been demonstrated. Water treatment processes will reduce this still further. Study of the characteristics of each water system, and where possible their improvement is therefore the next matter for attention.

In all planning and preparations the public health authorities should be consulted freely, especially with respect to measurement of contamination and wartime tolerances. It is a duty that all water engineers share alike with the health authorities to ensure that no effort is spared to ensure that the water which is passed on to the public shall not add significantly to the other hazards to which it most certainly will be exposed.

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Reprint from *Journal American Water Works Association* Vol. 53, No. 3, March 1961.

3. Radiological Decontamination of Food and Water in Nuclear War—Thomas R. Ostrom, Walter Reed. Army Institute of Research. ▲

The amount of radioactive material absorbed from early fallout by inhalation appears to be relatively small. The reason is that the nose can filter out almost all particles over 10 microns (0.001 centimeter) in diameter, and about 95 percent of those exceeding 5 microns (0.0005 centimeter). Most of the particles descending in the fallout during the critical period of highest activity, e.g., within 24 hours of the explosion, will be considerably more than 10 microns in diameter (9.186 et seq.). Consequently, only a small proportion of the early fallout particles present in the air will succeed in reaching the lungs. Furthermore, the optimum size for passage from the alveolar (air) space of the lungs to the blood stream is as small as 1 to 2 microns. The probability of entry into the circulating blood of fission products and other weapon residues present in the early fallout, as a result of inhalation, is thus low. Any very small particles reaching the alveolar spaces may be retained there or they may be removed either by physical means, e.g., by coughing, or by the lymphatic system to lymph nodes in the mediastinal (middle chest) area, where they may accumulate.

(*The Effects of Nuclear Weapons*) April 1962.

HURRICANE CARLA

THE GREATEST HURRICANE in U.S.A. recorded coastal history, *Carla*, struck the Texas coastline on Monday, September 11th, 1961. It packed the power of an estimated several hundred nuclear devices and triggered a test of evacuation capabilities far in excess of any exercises which civil defence planners had been able to achieve in years of effort:

Soon after the hurricane the U.S. Department of Defence received inquiries from many parts of the United States and other countries concerning the unprecedented success of the evacuation of the coast areas and its significance for national survival planning. As a result, a comprehensive report, which deals primarily with the evacuation, reception and re-entry phases, entitled HURRICANA CARLA was prepared by Mattie E. Treadwell, OCD Texas State Director for Field Operations. The following paragraphs which deal with the evacuation phase have been extracted from this report.

Louisiana

In all, the Louisiana CD Agency estimated that at least 50,000 persons had been evacuated, while the Red Cross, based on numbers in shelters felt that 75,000 or 80,000 persons were involved. This was the biggest evacuation in Louisiana history, but only a prelude to the massive Texas evacuation yet to come.

There was, then or later, no evidence that the Louisiana evacuation had been over-hasty or overdone. Although spared the brunt of the storm, coastal areas quickly flooded; a parish sheriff felt that, "If *Audrey* hadn't happened, *Carla* would have drowned thousands." If the eye of *Carla* with its 18-foot tides had entered the Louisiana coast, whole parishes would have been submerged, and without evacuation the loss could have exceeded 100,000 people.

The evacuation had scarcely been a real test of the Louisiana Survival Plan, written in 1957 with a Federal grant, and providing for evacuation of cities and use of coastal areas for reception. Rather, it had resembled plans for the evacuation of rural areas from fallout. However, the principles tested—physical and psychological—appeared quite similar to those simultaneously being demonstrated in the evacuation of Texas cities.

Texas

Texas' evacuation, which had begun around noon Saturday, was virtually completed by noon Sunday. It would never be known exactly how many had left, as uncounted thousands went out on their own, occupied private accommodations, and returned on their own. Estimates ranged from 300,000 to half a million, with some guesses, based on the accepted ratio of public to private lodging, going as high as 830,000. Most agreed that at least 500,000 was a reasonable figure, and the head of the Texas Department of Public Safety estimated that from 500,000 to 750,000 were involved.

In the entire movement, there was not a single fatality attributable to the evacuation. There was not even a reported major accident. The Governor felt that uncounted thousands of lives had been saved because local officials had the courage to attempt the evacuation.

Texas State officials felt that an excellent test had been given to the State's Operational Survival Plan. The head of the Department of Public Safety called it, "the wettest dry run in mass evacuation in the history of America."

Success of Evacuation

The Texas CD co-ordinator said, "The theory that people would not go, or would kill themselves on way, had been effectively disproved."

The success of the Carla operation left coastal officials without exception sold on evacuation as a practical, cheap and life-saving device. Agreement was unanimous among State and local officials that, if they had listened to defeatists and critics of evacuation, thousands of lives would have been lost. The Port Arthur CD director said, "Anyone who says now that total evacuation is impossible is crazy. It was proven; we did it. It can be done with firmness of officials and co-operation of the people. A few adjustments based on our experience could make it even more successful."

The extent of the success startled even those traffic experts who had engineered the operation. The State Director of the Texas Department of Public Safety said, "If someone had told me that we could have evacuated between half a million and 750,000 people, under the stress we had, and not have one fatality or injury, I wouldn't have believed him. If someone had told me there'd be no panic, I wouldn't have believed him."

Speedup Possible

All agreed that, in the event of enemy attack, the leisurely pace of evacuation could have been doubled

or tripled without much ill effect. The mayor of Lakeview said, "We could have done the evacuation three times as fast—using all four lanes and posting a few more police to speed it up." Beaumont officials agreed: "We could have speeded it up—cut off red lights, made it one-way." The LaMarque police chief added, "We would have more highways to use during enemy attack. About 90 per cent of our traffic went up one highway—all the other roads were reported closed by high water."

The Jefferson County judge stated, "If the warning had been of enemy attack, we would have acted more quickly; we would have borne down on orders to evacuate, not requests. If we had 2 hours instead of 6 or 8, we would have called for one-way traffic."

Feasibility of Evacuation in Enemy Attack

All agreed that evacuation on 15 minutes warning would be impossible except in the most thinly settled areas, a conclusion which was in line with current Defense Department thinking. However, most State and local officials felt that one of the nation's most valuable life-saving devices would be neglected if evacuation plans were not prepared and kept updated for use in:

(a) strategic evacuation in time of deteriorating international situation;

(b) tactical evacuation of fallout areas, if they lacked shelter, particularly in smaller cities and rural areas; and

(c) remedial evacuation of survivors from target areas after an attack.

The Louisiana CD director announced a revision of the State Operational Plan to include strategic evacuation:

> We are now revising the Louisiana State Plan to place more emphasis on strategic warning. The Federal Government at some point is going to have to get a time-table countdown. When you reach a certain point, then you move out the people. Some will have to stay for a while, of course, to keep things such as industry going.

City officials in Texas agreed that the trigger for a national strategic evacuation would best come from the President, who would best know when a deteriorating international situation would call for the exercise.

The amount of time under which local officials would undertake an evacuation on strategic warning varied from "A lot of time" in New Orleans, and 2 days in Houston, to 2 hours or less in Jefferson County and other cities not exceeding a few hundred thousand population, where it was felt that a large percentage of the people would reach safety from blast in 2 hours even if 100 per cent did not.

The Governor of Texas was also inclined to favour tactical evacuation on 1 or 2 hours notice in the path of advancing fallout in areas where shelters were insufficient to house everyone, particularly smaller cities and rural areas. It was noted that in recent test exercises Texas—unlike the Eastern States—had sustained maximum attack patterns without encountering lethal fallout over much of the state, and even this chiefly in narrow bands of 20 to 40 miles in width. With 94 per cent of its existing shelter in only 14 of its 254 counties, Texas officials were inclined to look on evacuation as a possible stop-gap in the other 240 counties until funds for shelters could be appropriated. Feasibility of the tactic would depend on adequate radiological monitoring and communications, which would enable the well-motorized Texas population to escape smaller cities and rural areas in the hour or more between explosion and arrival of fallout.

Officials continued to emphasize that strategic or tactical evacuation, rather than remedial, was the best answer to a disaster: "During *Audrey* we found it's practically impossible to evacuate an area after the disaster. Took us 48 hours to get the last person out then."

Possibly the greatest advantage of the evacuation was that, in proportion to the extent of its success, other disaster-operating problems were reduced. The Cameron Parish sheriff, veteran of *Audrey*, said, "it was a great feeling to know that 99 per cent of our people had evacuated and we wouldn't have to start saving human lives again."

The foregoing paragraphs should give an indication of the value of this report as a reference document to civil emergency planners concerned with planning for either pre-attack voluntary evacuation of the more likely target areas in Canada or the post-attack remedial evacuation of seriously contaminated areas. The report also covers in considerable detail the arrangements made for warning, reception and shelter, actual hurricane operations, re-entry, rehabilitation and disaster organization and equipment. As a consequence it is also most useful background material for planners concerned with similar phases of national survival. Copies of this report may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. (55 cents, U.S.)

THE FEDERAL FINANCIAL ASSISTANCE PROGRAMME

IT WOULD BE at the municipal level that the effects of a nuclear war would be felt first. It is therefore important that municipalities make preparations which will enable them to react to such situations in a way which would assist the population in surviving the hazards which may arise; as well as take whatever remedial action is required to ensure the continuity of essential community services. A national survival programme cannot be expected to succeed in achieving its aim unless municipalities, coordinated by their provincial governments, are prepared to accept these basic responsibilities.

The essential role of the municipality was recognized by the federal government when it reconstituted civil defence in 1948. It was further agreed that the cost of implementing an effective civil defence programme would be beyond the economic capabilities of most municipalities.

To this end, the federal government in April, 1952, offered to assist in developing provincial and municipal civil defence programmes by assuming 50 per cent of provincial costs. The maximum financial assistance the federal government offered the province was established at 8 cents per capita (1951 census) plus an additional 6 cents per capita in areas designated as likely target areas.

The federal government also offered to assume one-third of the cost to standardize hose couplings and to enter into an agreement with the provinces to share equally the cost of workman's compensation paid to civil defence workers.

Responsibility for administering the programme was assigned to the Minister of National Health and Welfare, a responsibility which was to continue until 1959.

During the first two years of the programme (1952-53 and 1953-54) the federal appropriation totalled $1,400,000 annually. In 1954, federal assistance was increased to a maximum per province of 11 cents per capita plus an additional 9 cents per capita in areas designated as likely target areas. Consequently, from 1954 until 1959, the federal appropriation to support the Assistance Programme was $2,000,000 per year.

A number of minor changes occurred during this period and in 1956, the federal government offered to share directly with municipalities, subject to provincial agreement, the costs of civil defence projects to which the province did not wish to contribute.

In 1957, the Financial Assistance Programme was extended to include the Northwest Territories.

Following a study of the Graham Report, the Prime Minister stated in the House of Commons, March 1959, that the federal government had decided upon a re-organization of the civil defence programme. In essence, the government undertook a major re-arrangement of civil defence functions and offered to assume directly certain responsibilities previously carried out by provinces and municipalities.

The federal plan of re-organization established two main principles:

(a) That civil defence should be considered a normal function or activity of government rather than a special organization and;

(b) That the civil defence function should be divided into clearly defined tasks and assigned to levels of government best able to undertake and discharge them.

Among the many changes in civil defence which occurred during this period of re-organization was the transfer of responsibility to federal EMO for the administration of the Financial Assistance Programme.

At the same time the federal government announced it was prepared to increase from 50 to 75 per cent the federal contribution towards the costs of approved provincial and municipal civil defence projects. Projects covering the purchase of equipment with a significant peacetime use would be subject to separate negotiations.

The federal government at this time also offered to increase its contribution to the workman's compensation paid to civil defence workers from 50 to 75 per cent.

It is also of interest to note that on March 23, 1959, the Prime Minister announced in the House of Commons: "We shall be quite prepared to agree that the provincial and local facilities, both of equipment and personnel, whose costs we may share for civil defence purposes, should also be made available to meet the humanitarian requirements of peacetime disasters as well".

The increase of the federal government's share in civil defence spending, coupled with accelerating municipal programmes, resulted in a progressively increasing federal civil defence budget over the ensuing years. Since the inception of the Programme federal appropriations and expenditures have been:

YEAR	APPROPRIATED	EXPENDED
1952/53	1,400,000.	246,858.
1953/54	1,400,000.	259,470.
1954/55	2,000,000.	415,825.
1955/56	2,000,000.	646,622.
1956/57	2,000,000.	813,685.
1957/58	2,000,000.	971,827.
1958/59	2,000,000.	1,030,351.
1959/60	2,000,000.	1,668,121.
1960/61	4,000,000.	2,245,354.
1961/62	4,350,000.	3,078,951.
1962/63	4,800,000.	

The expenditures indicate the growing interest on behalf of provinces and municipalities over the years.

Since 1952, the Financial Assistance Programme has been modified and amended in step with developing provincial and municipal programmes. Today, the F.A.P. is governed by a number of requirements which must be observed by provinces and municipalities wishing to take advantage of the federal government's offer of financial assistance.

Specifically, each province and/or municipality must provide the federal government with cost estimates of each project. In order to qualify for 75 per cent federal contribution projects must fall within one of three general classifications:

Classification I is designed to cover civil defence items of a basic and expendable nature. These would include the administrative costs of organizing and training civil defence workers; the cost of full and part time salaries of staff; travel expenses; the maintenance and up-keep costs of civil defence vehicles; rents and the payments for utility services such as water, light, heat and telephone.

Under the heading of Classification II are grouped the equipment and clothing required for administration, training and operations for which there is normally no peacetime use other than for civil defence.

This classification would include standard office equipment for equipping the office of the local emergency measures organization with desks, tables, chairs, typewriters, duplicating machines. It would also cover such items as rescue vehicles and rescue equipment, portable pumps and generators, protective clothing for volunteers and uniforms for police auxiliaries.

Classification III provides for proposed expenditures for the construction of, or alterations to, buildings required for civil defence purposes only.

A further Classification has been established to provide for equipment which has a significant peacetime use and which therefore must be negotiated separately for federal financial assistance. Under this classification are grouped such items as fire-fighting equipment; some types of communication facilities, and so forth.

It must be understood that the funds made available through the F.A.P. is only one of many programmes to which the federal government is committed. The programme known as F.A.P. has been established solely to provide financial support to provincial and municipal Emergency Measures Organizations, or their equivalents.

However, money alone will not accomplish the intent for which the Financial Assistance Programme was created. Sound preparations for national survival in the face of nuclear attack can only be achieved through the combined efforts of every Canadian municipality. ▲

SURVIVAL LITERATURE

Guide to the Preservation of Essential Records for Provincial Governments and Likely Target Areas.

—EMO Manual No. 2.

A booklet prepared by federal EMO to assist provincial and municipal governments in the selection, preparation and storage of those essential records required during and after a nuclear attack. The booklet suggests certain basic principles on records preservation applicable at any level of government. It illustrates these principles by copious examples of records common to provincial and municipal governments. Finally, it suggests certain mechanical aids that will assist in the process of preservation of records.

EMERGENCY HEALTH PLANNING

by

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ABSTRACT

This paper outlines the development of emergency health planning as a function of government. Ten provinces have the basic responsibility for the organization, preparation and operation of medical, nursing, hospital and public health services in an emergency. The Department of National Health and Welfare is responsible for the provision of advice and assistance to the provincial and municipal governments in such matters. Eight provinces have now hired full-time planning staffs to co-ordinate the health planning of the Provincial Departments of Health and Provincial Emergency Measures Organizations.

Four major programmes have been established. The first programme provides for the continuity of leadership and guidance by health authorities at the federal, provincial and municipal level. Essential records have been developed and emergency legislation prepared. This programme, however, will be of little use unless health services are organized at the municipal level. In this organizational programme, advice and assistance have been provided to existing hospitals and departments of health in the conduct of disaster planning. The efforts of these agencies are co-ordinated by municipal health authorities into a community disaster plan. The third programme deals with information and education of the general public and the health workers. This programme is designed to make the family unit self-sufficient for up to seven days and the health worker prepared to undertake his emergency role. The first three programmes are directed to the organization and training of manpower; the fourth programme provides the necessary supplies. From the national medical stockpile of $18,000,000, some $12,000,000 has been received, packaged for long-term storage and distributed to regional depots across the country. To ensure their ready availability in time of emergency an agreement has been reached with seven provinces for the release of hospital disaster kits.

Development of Emergency Health Services

FOLLOWING the transfer, in 1951, of the responsibility for civil defence from the Department of National Defence to the Department of National Health and Welfare, a civil defence health planning group was formed within the Health Branch. This group studied the health problems associated with the major threat of that time, namely the relatively small atomic bomb delivered by manned aircraft. In these studies, problems were referred to working parties selected from authorities on the particular subject. Information obtained by this and other means was provided to the health professions by means of articles, pamphlets and manuals and through courses, conferences and institutes held across Canada.

The development of the large thermonuclear weapon in 1954, and of new delivery systems, caused a major revision of Civil Defence Health Services' policies and programmes. This was followed in 1959 by a major reorganization of civil defence in which the Civil Defence Health Services became the Emergency Health Services Division of the Health Directorate of the Department of National Health and Welfare.

During this period, emergency health planning by provincial and municipal governments across Canada received widely varying degrees of emphasis, with few concrete achievements.

Responsibility for Emergency Health Services

In 1958, the Canadian Government surveyed the civil defence situation across the country. This survey was analyzed in the context of the total military and civilian arrangements necessary to prepare the country for the possibility of nuclear war. The Government decided to reorganize civil defence following two major principles: that civil defence should be considered as a normal function or activity of government rather than a specialized organization and that civil defence functions should be divided into clearly defined tasks and assigned to levels of government and, at each level, to those departments and agencies best suited to undertake and fulfil them.

In 1959, two Federal-Provincial conferences were held to discuss the responsibilities of the various levels of government. Amongst other emergency responsibilities that were considered to belong to the provincial authorities were:

The organization and control of medical services, hospitals and public health measures.

Organization of municipal and other services for the maintenance of water and sewage systems.

Training of civilians.

Reception services including arrangements for providing accommodation, emergency feeding and other supplies, and welfare services for people who have lost or left their homes, or who require

assistance because of the breakdown of normal facilities.

In the Civil Defence Order-in-Council issued in September 1959, the Minister of National Health and Welfare was charged with "the provision of advice and assistance to provincial and municipal governments and to others in connection with the organization, preparation and operation of medical, nursing, hospital, and public health services".

The role of the Canadian Forces Medical Services in survival operations is related to the role of the Department of National Defence. Since the Canadian Army is responsible for the re-entry operation into disaster areas, the Surgeon General agreed that the Canadian Forces Medical Service should assist in the provision of early treatment to the injured. Close liaison is essential between the Canadian Forces Medical Service and the civilian emergency health authorities at all levels of government, to avoid duplication of effort, and to ensure the smooth transfer of casualties from the scene of the disaster to civilian medical facilities.

Municipalities are delegated responsibility by the provincial authorities for the organization and control of municipal health services within the framework of the provincial plan and with technical and financial assistance provided by the provincial and federal governments.

The Planning Organization

The Minister of National Health and Welfare, recognizing that his responsibilities for emergency health planning were too great to be assumed by the existing staff of his department, organized the Emergency Health Service Division as the Health Branch planning agency. In addition, this Division is responsible for providing advice on emergency health matters to other governmental planning agencies.

The Emergency Health Services Division consists of 15 officers and some 60 staff on full-time employment. However, in the conduct of such planning, the Division uses the entire resources of the Health Branch as required. In addition, in each province, the Department has appointed a federal employee as the Regional Emergency Health Services Officer. The services of these officers are available on a part-time basis.

The Minister of National Health and Welfare formed an Emergency Health Services Advisory Committee in 1961. This Committee consists of representatives of the national associations of the various health professions, together with representatives of the Surgeon General Canadian Forces Medical Service and the Director General Dental Services.

In November 1959, Federal Emergency Health Services arranged a national conference on emergency health planning, at which time the Federal authorities recommended the establishment of a suitable planning staff by the provincial governments. Since then, eight of the provinces have organized full-time planning staffs, and the remaining two provinces have designated officers on a part-time basis.

Most of the provinces have established an Emergency Health Services Advisory Committee which includes representatives of the various provincial colleges societies or associations.

The effect of this major achievement at the provincial level is reflected in the marked increase in the demands for advice and assistance from the municipalities. At least two major cities now have designated full-time planning staffs, and many communities have assigned the responsibility for this function to the municipal medical officer of health.

Emergency Health Services Programs

The activities of the Emergency Health Services planning staff at the various levels of government can be broadly grouped into four major programs.

1. *Continuity of Government*

Individual members of each family unit are responsible for taking the necessary steps to ensure their personal survival during the immediate post-attack period. However, if we are to continue to survive as an organized society, we must ensure the continuity of governmental authority to provide for such things as equitable distribution of food stores, continuing health services, restoration of communications and transportation. Above all, we must provide for the continuance of leadership and guidance to our people.

The programme is carried out by all essential departments of government. Alternate sites have been selected and are being prepared now for use in an emergency. Essential records and documents have been duplicated and legislation has been prepared. The staff for each site has been designated, and they are presently being trained for their emergency role.

At the national level, there are a number of centres for government, designated generally as the central facilities. Here, government leaders will meet to carry out their emergency functions and prepare policy decisions. However, these sites are not large enough for the operation of essential government departments. Consequently, departmental relocation sites are being set up throughout the Ottawa Valley, where selected departmental officers will carry out their operational responsibilities.

At the provincial level, regional headquarters are under construction. These headquarters will house key officials of the provincial health agencies, together

with the Federal Emergency Health Services officer and the military medical representatives. However, the provincial department of health must also establish a relocation site from which the operations of the provincial health services will be directed.

Since it would be extremely difficult to direct all the municipal civil defence organizations from one regional headquarters, most provinces have established zone headquarters to provide an intermediate level of command and control. These headquarters require a medical staff to direct the provincial emergency health services.

In most municipalities, governmental functions would be carried out in the normal location. However, in 16 possible target cities, alternate sites of municipal government are being prepared. To support re-entry operations in these areas, the Canadian Army has prepared 16 target headquarters. Municipal and provincial emergency health representatives are being assigned to these headquarters.

This programme has been designed to ensure continuity of government at the Federal, provincial, and municipal levels. Emergency Health Services staff must be prepared to ensure the maximum use of our surviving health resources in the post-attack period.

2. *Organization Programmes*

The previous programme will be of very little use unless health services are organized at the community level. In this organizational programme, we have followed certain basic principles. Existing health agencies and organizations are the basic structure for an emergency service. In a community, the two types of organization suitable for emergencies are the hospitals and the departments of health.

The first project in this programme was the stimulation of hospitals to carry out disaster planning. Approximately 50% of hospitals to date have developed reasonable plans, and emphasis on this phase is continuing.

The second phase of the programme entails the action of municipal health authorities in preparing a community disaster plan. Such a plan must provide for the co-ordination of hospital plans for casualty care as well as the preventive health measures to be instituted by the Departments of Health. Community planning provides the method of affiliation of health workers to a specific organization within which they perform their emergency function.

3. *Information and Education Programmes*

Information and educational programmes directed at the general public are designed to make the family unit self-sufficient for the first seven to 14 days of a national emergency. Information on measures to deal with likely health hazards is provided through brochures, pamphlets, displays and other media of communication. In addition, we place great emphasis on a comprehensive first-aid and home-nursing training programme. In the past five years, approximately 500,000 lay persons have been trained under the auspices of the St. John Ambulance Association and negotiations are under way to have such training incorporated in the curricula of high schools.

Information and educational programmes directed at the health worker have been developed in two distinct areas. It is unreasonable to expect any individual to perform an emergency function if his family is in danger. Consequently, with the co-operation of the various national and provincial associations of the health professions, information on family survival planning is made available to the members of that profession.

The second area involves the training of workers in the professional aspects of their emergency functions. This programme is conducted at both the undergraduate and postgraduate level. Six of 12 medical schools at present teach some aspects of emergency medical care, and measures are under way to expand this project. All schools of nursing conduct some training in emergency nursing care, and we hope to improve and standardize this teaching. Suitable training is being incorporated in curricula for sanitary inspectors and other health workers.

The major problem rests in the field of post-graduate education. The bulk of this training to date has been carried out centrally at the Civil Defence College, but during the past year, provincial health authorities have expanded this programme by means of courses, seminars and institutes conducted within the provinces.

4. *National Health Stockpile Programme*

The first three programmes are directed to the organization and training of an Emergency Health Services organization. The fourth programme provides the essential supplies.

The Federal Government has authorized the establishment of a national stockpile of health supplies and equipment amounting to some $18,000,000. To date, Emergency Health Services have received stores to the value of $12,000,000. These have been packaged and distributed to regional depots across the country. Orders have been placed for an additional four million dollars.

This stockpile contains both packaged units and bulk resupply items designed to provide medical care for 200,000 casualties. The packaged units consist of hospital disaster kits, advanced treatment centres, 200-bed emergency hospitals, public health laboratories and blood transfusion depots. *Concluded on page 20*

RADIATION

Reproduced from the booklet "Exposure to Radiation in an Emergency". *Published by the National Committee on Radiation Protection and Measurements*

Effects on Livestock and Agriculture

General

IN AN EMERGENCY, the principal consideration with respect to food-producing animals is not their survival, as such, but their availability as a food resource. They should be dealt with, first, from the standpoint of the immediate requirements of food for the human population of the affected region and, second as a continuing resource during recovery from the disaster. Exposure to gamma radiation does not impair the nutritional value of meat, even though the ensuing radiation sickness and concomitant bacterial infection may affect it adversely. Carcass meat and food products contaminated by fallout may be found to be suitable for human consumption, depending on the amount and kind of radioactive material present and the urgency of the needs of the people.

Livestock

Livestock may be injured or killed by a radioactive cloud or by fallout. The MLD[1] for farm animals has been determined experimentally and is much more certain than the MLD for man. For brief exposures (i.e., over a period shorter than 4 days), the 50 per cent lethal dose is about 650r±10 per cent and is approximately the same for mature cattle, sheep, pigs, and burros. When the dose is protracted, pigs are found to be unusually resistant. When the lethal dose is a single or brief exposure, most farm animals die during the second or third week. Animals that survive are also exposed to internal radiation from eating fallout that contaminates the pasture land. During a nuclear war, it may be desirable under some circumstances to round up exposed animals and slaughter them promptly for food. Exposure to external y-radiation[2] does not affect the food value of the meat. However, meat may become contaminated by ingested fallout. Such contamination will decrease because of radioactive decay while the meat is in storage. Also, such contamination may be avoided by proper selection of portions to be consumed.

Chickens

Chickens that survive a dose of several hundred r are able to resume egg-laying. Those from Rongelap in the Marshall Islands, for example, started laying again about 40 days after exposure. The eggs were radioactive, but the majority of radioactivity, 70 - 80 per cent, was in the shells. Strontium-89 was the most important fission product in the edible portion, and the amount was insignificant—less than 0.5 per cent of the MPC for water. It is probable that chickens will not lay if the radioactive body burden is large enough that their eggs are unfit to eat. The MLD for chickens is two to three times greater than for farm mammals. Ordinarily, chickens are fed stored foods, and, because of this, it is probable that chickens can serve as a major relatively uncontaminated source of food early in the post-disaster period.

Milk

Milk may be contaminated with radioisotopes from fallout; the most important of these are iodine and strontium. Cows that have received a large dose of external y-radiation or a large dose of internal radiation from ingested fallout will soon cease to give milk. The fact that a cow still produces is evidence that radiation injury is minimal and that the body burden is not great. Nevertheless, action may be required regarding the disposition of the milk. A realistic decision requires accurate radiological measurement of the contamination, most of which will consist of radioisotopes of iodine and strontium. Until data are available, such milk can be diverted to cheese or powdered-milk plants for processing. The products can be stored while radioactive decay continues and until Public Health officials make decisions concerning the wholesomeness of these foods.

Sea Food

Sea food contaminated by fallout should be handled in the same manner as milk. It can be frozen and stored until precise radiological measurements are obtained. The final decision in such cases should be left to proper officials, who may be guided by statements published by the NCRP on permissible amounts of radionuclides in the human body and in material entering the body.

Standing Crops

Standing crops can be contaminated directly by fallout and also can absorb radioactive isotopes from contaminated soil. Except when the emergency and the time of harvest coincide, decisions regarding the handling of standing crops are not urgent. Radiological data should be secured before any action is taken to destroy food crops.

[1] *MLD*—Median Lethal Dose—is that amount of radiation over the whole body which it is expected will be fatal to 50 per cent of a large group of living creatures.

[2] *External y-radiation*—in the context used means the dose the meat would receive from fallout *outside* the animals body rather than the y dose the animal would receive as a result of ingesting y emitting fission products. What the author intends here is that fallout radiation will not adversely affect the food value of meat animals unless the fallout is ingested by the animal.

ROLE OF THE DENTIST IN A NATIONAL EMERGENCY

Emergency Health Planning Division
Department of National Health and Welfare

DURING the past five years emergency planners have conducted many studies on the magnitude of the problems facing the health services in the event of a nuclear attack on the North American continent. A recent study is depicted graphically in Figure 1.

This study employed the combination of factors which would produce the maximum workload. Alteration of any of the conditions selected such as size of weapon, lack of organized rescue, climatic conditions, or population characteristics might significantly increase the number killed but would reduce the quantitative requirement for health services. However, pre-emergency planning by the responsible agencies in each of the three functional areas concerned, could effect significant savings in lives and the reduction of suffering in the injured survivors.

With our present state of preparedness, we could expect, if our 16 major urban areas were attacked to-night: 2,500,000 killed; 1,250,000 injured and 3,500,000 intact survivors.

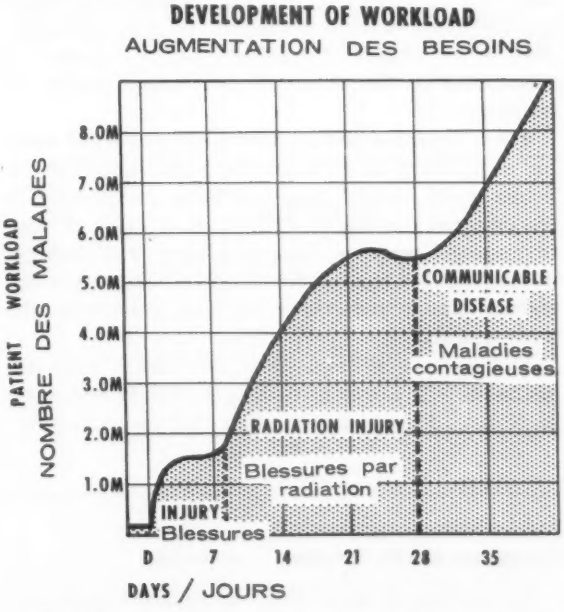
This presents a major problem in casualty care with approximately twelve times the normal population of our active treatment hospitals receiving injuries over a period of a few hours. Fifty per cent of the active treatment hospital beds are located in these urban areas, subject to damage and approximately 9,000 of the 20,000 physicians in Canada live in these cities.

But this is not the complete problem, for 3.5 million intact survivors in these cities and 11 million Canadians in other parts of the country would be at risk of injury from radioactive fallout. On any given day, about 7-8 million would be directly affected, with 5 million receiving sufficient injury to require medical care. Weather conditions at the time of attack would determine which segment of the population would be exposed to this preventable injury. These injuries would appear about the third day after the attack, reaching a peak about the twenty-first day.

And this is still not the complete problem for we could expect with the disruption of health services, that communicable disease would reach epidemic proportion by the thirtieth day and to this could be added the casualties from exposure and malnutrition.

This study presents the catastrophic picture envisaged if the health services and other agencies are not prepared. This escalation of workload must not be permitted to occur, for if it does, we will have ceased to function as a responsible organized society. Plans made now for the use of the skills and resources of medical and allied professions will determine whether the country continues to exist or dies.

The immediate survival of an injured person will depend on his own ability to help himself or on the presence of other members of the family or neighbours who can administer life-saving first aid measures. This may be the only help available for a period of hours or even days. Subsequently he is dependent on the promptness and scale of the rescue and first aid services provided by the Mobile Survival Columns of the Canadian Army. His continued survival is then dependent on the ability of the casualty care teams in the medical units close to the scene of the disaster, to provide emergency medical care and transport to existing and emergency hospitals with the capability for life-saving surgery.



Obviously a great disparity exists between the large numbers of casualties predicted and the numbers of physicians that would be available to provide emergency medical and surgical care. Planning must provide means to reduce this disparity. If the casualty load cannot be lessened, then the services of the physicians must be expanded by the use of other professionally trained health personnel as members of the treatment team.

The dental profession is a logical source of reinforcement of the physicians and surgeons for mass casualty care. The professional training of the dentist more closely parallels that of the medical profession than is the case of any other group. Numerically, dentists constitute the largest group of professionally trained workers next only to the medical and nursing groups. The dentist-physician ratio at present is 1:3.

It is true that in a national emergency, the average dentist will encounter problems outside and beyond his range of normal day-to-day experience; but then who amongst us won't? On the other hand, the training, skills and practical experience of Canadian dentists have prepared them uniquely for the additional training required to enable them to share the load.

What are some of the attributes of the average dentist that have a bearing on the expansion of his functions to serve as a member of the emergency medical team? First, as an undergraduate, he received training in the basic medical sciences. He was trained in the principles of medicine and surgery, in the administration of anaesthetics, in pharmacology and radiology. He began as a senior student to learn the art of patient care. Then as a practising dentist he acquired skill and experience in treating patients, not infrequently under extreme conditions of pain and infection, in the control of haemorrhage, in treatment of shock and in the reduction and immobilization of fractures.

Many Canadian dentists have taken specialized training in a variety of fields ranging from anaesthesia to public health. All of these functions are essential in the emergency situation. Finally, as a result of their training and practical experience dentists characteristically possess a high degree of manual dexterity which enables them to master new technical procedures relatively quickly.

This concept of employment of dentists in an expanded role is not new. In World War II and again in Korea, dentists serving with medical units participated willingly in the emergency medical care of the injured during the periods of intense activity. It is worthwhile to note that almost half of the members of the dental profession have served in the armed forces.

In 1951, the Canadian Dental Association issued a statement of policy on Civil Defence. The Association considered that dentists could best serve as members of the casualty care team along with medical, nursing and other personnel and that those members of the profession having specialized training and experience should be assigned to posts where their services could be utilized to greatest advantage. The Canadian Dental Association stressed the fact that further training was required to fit the dentist for his duties and responsibilities in casualty care and recommended that such training be carried out in a representative team arrangement.

This general statement holds true today and could only be improved, perhaps, by a clear definition of the functions the dentist would be expected to perform. However, the assignment of a specific role to an individual dentist is entirely dependent on the state of organization of the emergency health services in the community. While this phase of planning has developed exceedingly slowly, Emergency Health Services anticipate that the increased emphasis on hospital and municipal disaster planning will result in the near future, in the closer integration of the dental profession and the individual dentist with the treatment and health teams of the community.

Conclusion

The dental profession have the basic capability which permits the expansion of their normal functions in time of emergency. The efficient use of these dentists, however, is dependent on the development of an organization in which they can be assigned a specific role and through which they can receive the additional training needed to fit them for their responsibilities.

Emergency Health Planning *(Conclusion)*

Maintenance of these stocks in regional depots does not ensure their ready availability in time of emergency. Agreement has been reached with seven of the provinces for the release of hospital disaster kits to hospitals within the province which possess an approved disaster plan. In addition, negotiations are under way for the release of other packaged units as the emergency organizations are developed.

Conclusion

In this paper, the development of emergency health planning has been discussed and the responsibilities of government have been outlined. Emergency planning by Federal and provincial health agencies is futile unless the individual members of the health professions are ready to undertake their individual, family and community responsibilities to prepare for a national emergency. ▲

MODEL SHELTER DISPLAY

Similar models of the above fallout shelter display are available now in all provinces for use at exhibitions, fairs, etc . . . The scale models of the various shelter designs shown in the display are described in the leaflet "SIMPLER SHELTERS". A copy of this leaflet may be obtained by writing to Box 10,000 in your provincial capital.

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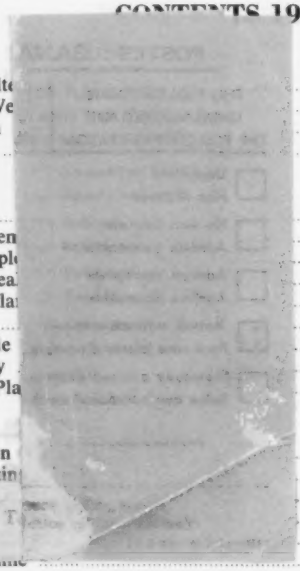

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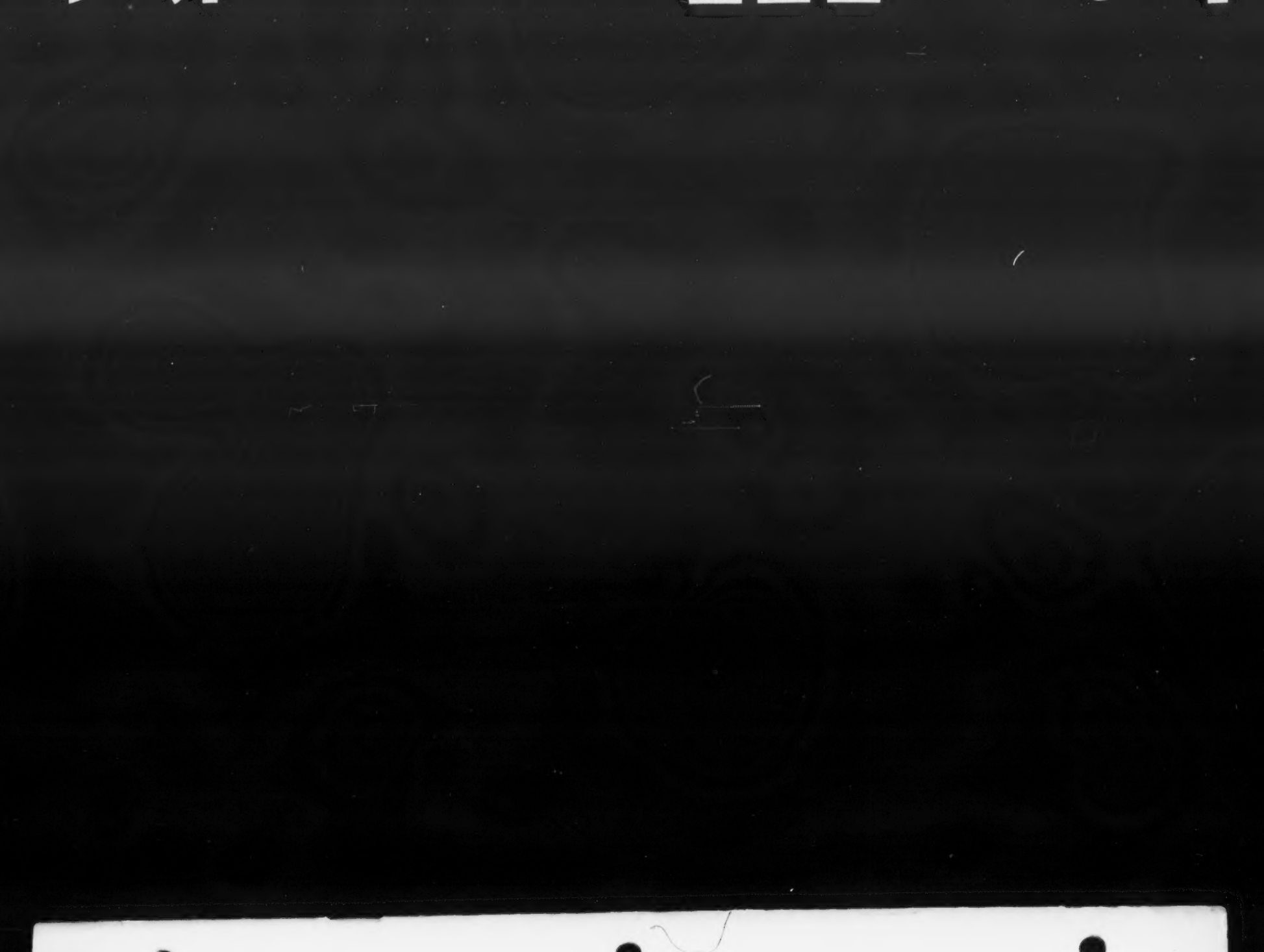
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